Innovative Use Cases for the new REDCap EHR Integration Module
Agenda

• **Introducing**: REDCap & REDCap Consortium

• **Inventing**: EHR + EDC Interoperability

• **Innovating**: Applied Model for Clinical Trials
Invention and Innovation

- **Invention** means having a totally original idea and showing how it can work in theory.
- **Innovation** means putting a new idea into practice. This could be either bringing a new product to the market or by getting an organisation to try a new way of working.
The process of translating an idea or invention into a good or service that creates value or for which customers will pay at Vanderbilt and across the REDCap Consortium.
Agenda

• Introducing REDCap & REDCap Consortium

• Inventing: EHR + EDC Interoperability

• Innovating: Applied Model for Clinical Trials
Features of REDCap

- Fast and flexible. ...
- Build online surveys and databases quickly and securely. ...
- Export data to common data analysis packages. ...
- Easily manage a contact list of survey respondents or create a simple survey link. ...
- Scheduling. ...
- Save your data collection instruments as a PDF to print. ...
- Ad hoc reporting. ...
- Advanced Features.
System Statistics

**Total projects** (excludes 'practice' projects) | 68,672
- Production | view types | 25,145
- Development | view types | 29,768
- Inactive | view types | 3,028
- Archived | view types | 10,731

- **Project types**
  - Projects not containing surveys | 16,422
  - Projects containing surveys | 52,250

- **Project purpose**
  - Research | view subcategories | 17,777
    - Basic or bench research | 2635
    - Clinical research study or trial | 6742
    - Translational research 1 (applying discoveries to the development | 865
    - Translational research 2 (enhancing adoption of research findings | 758
    - Behavioral or psychosocial research study | 4499
    - Epidemiology | 1168
    - Repository (developing a data or specimen repository for future u | 810
    - Other | 1674
    - [Subcategory not selected] | 930
  - Operational Support | 21,204
  - Quality Improvement | 21,141
  - Other | 7,883

**User Statistics**

- Users currently logged in | 972
  - Project users | 481
  - Survey participants | 491
Available at no cost to Academic, Nonprofit, Government Organizations

REDCap
Research Electronic Data Capture

Institutions 3741, Countries 131, Projects 783k

over 1,060,000 users.

Map of REDCap Consortium Partners
<table>
<thead>
<tr>
<th>Country</th>
<th>Institution Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
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<td>Sociedad Argentina de Cardiologia</td>
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<td>Australia</td>
<td>Biologic Data Science Institute The Australian National University</td>
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<td>Universidad Mayor de San Simon</td>
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<td>Brazil</td>
<td>Centro Universitário São Camilo</td>
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<td>Brazil</td>
<td>Instituto de Doenças do Tórax da Universidade Federal do Rio de Janeiro</td>
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<td>Montreal Heart Institute Reseach Center</td>
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<tr>
<td>Canada</td>
<td>Vancouver Infectious Diseases Centre</td>
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<tr>
<td>Switzerland</td>
<td>Jacobs Center for Productive Youth Development - University of Zurich</td>
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<tr>
<td>Cote d'Ivoire</td>
<td>Programme PAC-CI</td>
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<td>China</td>
<td>Chinese holistic integrative med-ic</td>
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<td>China</td>
<td>Dept. Neurosurgery, West China Health</td>
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<td>China</td>
<td>Sun Yat-sen Global Health Institute</td>
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<td>Klinikum Dortmund gGmbH</td>
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<td>Nigeria</td>
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<td>Netherlands</td>
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<td>Senegal</td>
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<tr>
<td>Zimbabwe</td>
<td>Africa University</td>
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</table>
> 8,300 articles in diverse biomedical research domains have cited use of the platform
This is great, but will it do …

Used Systems Get Better …
It’s the **Bi-Directional Empowerment** ...

Used Systems Get Better ....

**REDCap**
Dev Team

**REDCap**
Consortium

over 1,060,000 users.
Agenda

• Introducing REDCap & REDCap Consortium

• Inventing: EHR + EDC Interoperability

• Innovating: Applied Model for Clinical Trials
Any chance you could integrate in some way with our EHR?
Any chance you could integrate in some way with our EHR? e.g. so we don’t have to copy/paste?

That’s pretty hard to do .... EHR vendors are different and tend to hang onto their data, lack of standards, mapping is complex, permissions, regulatory requirements, privacy requirements, ‘easy’ at project level – but hard to scale, even harder across institutions, blah, blah, blah
Vendor for VUMC clinical systems upgrade named

Dec. 18, 2015, 1:04 PM

Vanderbilt University Medical Center (VUMC) has announced an agreement with Epic Systems Corp., a privately owned health care software company based in Verona, Wisconsin, to provide key clinical, administrative and billing software to the Medical Center.

In November 2017, staff and faculty will switch to Epic software for medical record-keeping and clinic workflow, ordering of tests and treatments in hospitals and clinics, hospital scheduling and admissions, nursing documentation, medical management of surgical patients, outpatient prescribing, medication administration, (non-retail) pharmacy management and hospital billing.

Patients also will begin a transition to Epic software in order to continue engaging with their healthcare team and clinical information via the My Health at Vanderbilt patient Web portal.

Other applications to be covered by the agreement are yet to be determined pending a more detailed review of information technology needs across VUMC.

Vanderbilt sought new software because in March 2018 McKesson Corp. will stop supporting applications VUMC currently uses for hospital clinician order entry, nurse documentation, medication administration and pharmacy management.

Leaders say the agreement with Epic signifies a momentous transition at VUMC, which will result in a more integrated, efficient, and mature information systems environment.

Most of the major clinical systems in use today at VUMC were developed here. Vanderbilt is among a handful of institutions that have pioneered biomedical informatics and health information technology over the past 25 years.

EpicLeap launch signals start of bold new era


On Nov. 2, Vanderbilt University Medical Center (VUMC) will switch to a new computer system, called eStar, which will support the health system’s electronic health records, workflows for inpatient and outpatient care delivery, test ordering, billing and other hospital and clinic operations.

EpicLeap, the name given to the two-year project to switch to the new system, affects some 18,000 Medical Center employees who work in the health system, as well as VUMC’s patients who use the My Health at Vanderbilt web portal to communicate with clinicians regarding their care.

Benefits of eStar include:

- Compared to the group of applications being replaced, eStar is light years ahead from a systems integration standpoint. Leaders say greater systems integration and ease of use promises better coordination of care across different care settings, and greater efficiency for clinical teams.
- Fees for hospital and professional services will be consolidated as one bill instead of two, simplifying payments for patients.
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The eStar Galaxy

At the center of the EpicLeap galaxy is a system known as eStar, which comprises 25 different modules of Epic software. These modules underwent extensive customization to ensure they are fit for VUMC's specific needs.
INVENT NEW METHODS
Value Proposition

- Instant Data Flow
- No Research Data Warehouse Dependency
Value Proposition
• Research-Centric Workflow
Real Estate Data Flow

If you can **think it**, you can **do it**
Real Estate + Data Flow

Value Proposition
- Research-Centric Workflow

Value Proposition
- Instant Data Flow
- No Research Data Warehouse Dependency

If you can **think it**, you can **do it**
Creating REDCap Project-Level Mapping for EHR→REDCap Data Exchange

Not as easy as it looks ...
Enabling Workflow (REDCap in EHR)
Enabling Workflow (REDCap in EHR)
Enabling Workflow (REDCap in EHR) - continued
Enabling Workflow (REDCap in EHR) - continued

---

**Record: REDCap**

- **MRN:** 997000033 – Zzztest, Tdrthirdythree (DOB 1990-07-05)
- **Project:** DDP_On_FHIR_Example

**Adjudicate data from eStar**

View DDP adjudication instructions

- Fetching data for **Study ID “2”**
  - Time of last data fetch: less than a minute ago
  - MRN: 997000033

**New items:** 13

<table>
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<th>REDCap Field</th>
<th>REDCap Date/Time</th>
<th>eStar Source Date/Time</th>
<th>REDCap Current Value</th>
<th>eStar Source Value</th>
<th>Import?</th>
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<td>-</td>
<td>-</td>
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For full REDCap functionality, log in to REDCap in your web browser.
Enabling Workflow (REDCap in EHR) - continued

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<tr>
<td>Consent Form</td>
<td>[DDP On FHIR Example</td>
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</tbody>
</table>

**Baseline Information From EHR**
- Multivitamin (THERAGRAN) tablet tablet, 1000, Take 1 tablet by mouth daily. - 2017-11-06

**Baseline Medication List**
- Generalized anxiety disorder (300.02),
- Generalized anxiety disorder (F41.1),
- Generalized anxiety disorder (disorder) (21897009) - active - 2017-12-08
- Right tubal pregnancy without intrauterine

**Baseline Problem List**
- No known allergy (SNOMED CT 716186003) - 2017-12-08
Workflow-Neutral Data Flow
(this time from REDCap ... after typing in MRN)
Workflow-Neutral Data Flow
(this time from REDCap ... after typing in MRN)

![Image of REDCap interface](image-url)

### Demographics

<table>
<thead>
<tr>
<th>REDCap Field</th>
<th>REDCap Date/Time</th>
<th>eStar Source Date/Time</th>
<th>REDCap Current Value</th>
<th>eStar Source Value</th>
<th>Import?</th>
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</table>
Data Flow Based on Temporal Input (e.g. Visit Dates)
(Enter Date and REDCap Fetches Data From EHR)
Data Flow Based on Temporal Input (e.g. Visit Dates)
Any chance you could integrate in some way with our EHR?

WE LOVE IT!

50%
Any chance you could integrate in some way with our EHR?

THAT ISN’T WHAT I HAD IN MIND

FIRST USE CASE: CRF MAPPING
SECOND USE CASE: DATA MART

If pulling time-based data, select the range of time from which to pull data (optional)

from [ ] to [ ]

Enter medical record numbers of patients to import from the EHR (one per line, optional)

Total MRNs: 0

Choose fields in EHR for which to pull data

Source Fields List

- **Id (Medical record number)**
  - [ ] select all

- **Condition**
  - [ ] select all

- **Medications**
  - [ ] select all

- **Allergy Intolerance**
  - [ ] select all

- **Vital Signs**
  - [ ] select all

- **Laboratory**
  - [ ] select all

Filter: search source fields by keywords

Create Project
Any chance you could integrate in some way with our EHR?

WE LOVE IT!

SECOND USE CASE: DATA MART
Agenda

- Introducing REDCap & REDCap Consortium
- Inventing: EHR + EDC Interoperability
- Innovating: Applied Model for Clinical Trials
Changing the world at Vanderbilt
- Dynamic Data Pull (DDP) - Clinical Data Pull
Data values pulled from source system via DDP on FHIR: 228,966
Data values adjudicated by users via DDP on FHIR: 21,164
Records with data values adjudicated by users via DDP on FHIR: 1,762
Projects with data values adjudicated by users via DDP on FHIR: 11
Projects with DDP on FHIR enabled: 19
Real World

INNOVATION

Changing the world at Vanderbilt
DDP on FHIR with EHR Launch

REDCap can communicate with any EHR (electronic health record) system that has implemented 'SMART on FHIR' web services that allow for interoperability and data extraction from the EHR. In this way, REDCap can be embedded inside and launched within an EHR user interface (e.g., Cerner, Epic, HyperSpace), which allows REDCap users to easily add patients to their projects and/or to access patient data inside a REDCap project. In addition to launching REDCap inside the EHR, REDCap can also extract data from the EHR to import clinical data into a REDCap project by using a feature called 'DDP on FHIR' (Dynamic Data Pull using SMART on FHIR). DDP on FHIR provides an adjudication process whereby REDCap users can approve all incoming data from the EHR before the data is officially saved in their REDCap project.

Before 'DDP on FHIR with EHR Launch' can be used by REDCap users, it must first be set up and enabled on this page. To get started, download the ZIP file linked below, and follow the instructions contained therein. There may be instructions for your particular EHR, but if not, then you may use the 'Instructions - General' file. After you have followed the setup procedures, all REDCap users who wish to use this feature must first launch REDCap from within the EHR user interface. That step is the starting point for all users and is mandatory for REDCap to determine that the user truly has access to the EHR. Once that step has been completed, the REDCap user may use DDP on FHIR solely from the REDCap side (without being inside the EHR), if they wish, for any projects that have DDP on FHIR enabled, or they can utilize REDCap as launched from within the EHR as well.

[Setup instructions and technical specifications (ZIP)]
[Informational page on how to use DDP (for providing to users)]

Enable 'DDP on FHIR with EHR Launch'

Once DDP on FHIR is enabled for the system, it can then be enabled for a given project by an Administrator on the project's Project Setup page in the (optional modules and customizations) section. Also, users that launch REDCap from inside the EHR system will be able to access their DDP on FHIR projects from the EHR interface.

Custom name for the EHR system

This will be the name of the EHR system as it is displayed for the user, if left blank, it will simply say 'EHR' in its place.

Epic

e.g., Epic, Cerner, EMR, EDW

Redirect URL (to add to your FHIR client for REDCap)

Copy and paste the Redirect URL below and provide it to your EHR technical team to be added to your FHIR client.

Redirect URL (read-only):

EHR-specific and FHIR-specific settings

Client ID and Client Secret for the FHIR app/client created for REDCap in the EHR

These are essentially a username and API key that REDCap will use to communicate with your EHR using the SMART on FHIR services. These client values will likely need to be generated for you by your EHR's technical team.

Client ID:

Client Secret: ***************

(Make sure that the Client Secret is the secret value itself and not the stored hashed value of the secret.)
Setting up REDCap on FHIR
Changing the world at...
What if ...

INVENT NEW METHODS

Better, Cheaper, Faster

REAL WORLD INNOVATION
Democratizing EHR extraction methods should improve efficiency in multi-site data collection.
High-Level Data Flow Schematic

EHR (Epic)

Trigger

Candidate MRN

Local

REDCap Local

Custom Listener Web Service

Screening Database
- Traditional -
(1 row per patient)

DCC
High-Level Data Flow Schematic

- **EHR (Epic)**
  - Candidate MRN
  - **Trigger**
  - **Screening Database**
    - **FHIR**
    - One-Time Data Pull

**Local**

- **REDCap**
  - **Custom Listener Web Service**
  - Local

**DCC**
High-Level Data Flow Schematic

EHR Epic

Trigger

Candidate MRN

Custom Listener Web Service

One-Time Data Pull

Screening Database
- Traditional -
(1 row per patient)

FHIR

Eligible + Randomized MRN

Study Database 2
- Data Mart -
(1 row per patient fact)

Local

REDCap Local

Local DCC

DCC
High-Level Data Flow Schematic

- **EHR** - Epic
- **Trigger**
- **FHIR**

### Local
- **Candidate MRN**
- **Custom Listener Web Service**
- **Screening Database**
  - Traditional
  - (1 row per patient)
- **Study Database 2**
  - Data Mart
  - (1 row per patient fact)

### DCC
- **MRN**
- **Continuous Data Pull**
- **Eligible + Randomized MRN**
High-Level Data Flow Schematic

- **EHR (Epic)**
  - Trigger
  - Candidate MRN
  - Custom Listener Web Service

- **Screening Database**
  - Traditional
  - (1 row per patient)

- **Study Database 2**
  - Data Mart
  - (1 row per patient fact)

- **DCC (REDCap)**
  - De-Identified Data Extracts
  - (Every X Hours)

- **Data Lake**

**Processes:****
- One-Time Data Pull
- Continuous Data Pull

**Source:**
- Standard REDCap Web Service

**Trigger Events:**
- Eligible + Randomized MRN
High-Level Data Flow Schematic

**EHR**
- Epic

**Trigger**
- Candidate MRN
- One-Time Data Pull
- Continuous Data Pull

**FHIR**
- Screening Database
  - Traditional
  - (1 row per patient)
- Study Database 2
  - Data Mart
  - (1 row per patient fact)

**Local**
- REDCap
  - Local
  - Custom Listener Web Service
  - MRN
  - Eligible + Randomized MRN

**DCC**
- REDCap
  - DCC
  - De-Identified Data Extracts
  - (Every X Hours)
  - Data Lake

**Standard REDCap Web Service**
04/2019 - First Funded Trial (5 Sites) – Harris/Lindsell

REDCap / Epic Report Out
Trial Innovation Network

Duke Clinical Research Institute

University of Utah Health Care

Vanderbilt University Medical Center

Johns Hopkins Medicine

Tufts Medical Center

CTSA Clinical & Translational Science Awards

NIH National Institute on Aging

NIH National Library of Medicine

NIH National Center for Advancing Translational Sciences

Meharry Medical College
REDCap / Epic Report Out

- Dynamic Data Pull (DDP) - Clinical Data Pull
Data values pulled from source system via DDP on FHIR: 228,966
Data values adjudicated by users via DDP on FHIR: 21,164
Records with data values adjudicated by users via DDP on FHIR: 1,762
Projects with data values adjudicated by users via DDP on FHIR: 11
Projects with DDP on FHIR enabled: 19

04/2019 - First Funded Trial (5 Sites) – Harris/Lindsell

Next

New Recruitment / Retention Tools
Embed in TIN Trials (CTSA Adoption)

Feb 2019 → Oct 2019

Current App Orchard Download Ranking
#6 of 187 Apps

- REDCap
- Functional Areas
- Research
- Epic Versions
- Epic 2017
- Epic 2018
- Features
- Incoming API

- App Orchard
- Launched
- View What’s New

- Local Impact
- eStar

- Organization
- organization
- Allina Health
- BC HealthCare & Washington University
- CHEQ
- Children’s Healthcare of Atlanta
- Cliniques universitaires Saint-Luc
- Fairview Health Services
- Great Ormond Street Hospital for Children
- HealthPartners
- Hennepin Healthcare
- Houston Methodist
- Medical University of South Carolina
- Memorial Healthcare System (FL)
- Michigan Medicine
- Montefiore Medical Center
- Mount Sinai Health System
- New York Consortium
- North Oaks Health System
- Oregon Health & Science University
- Partners HealthCare
- Royal Children's Hospital Melbourne
- St Joseph's Healthcare Hamilton
- The Hospital for Sick Children
- The Ohio State University Wexner Medical Center
- The University of Kansas Hospital
- UC Health
- UCSF Health
- UNC Health Care System
- Univ of Texas MD Anderson Cancer Center
- University of Chicago Hospitals
- University of Colorado Health
- Vanderbilt University Medical Center
- Wayne Forest Baptist Health
- WellStar
- Yale New Haven Health System and Yale School of Medicine
REDCap / Epic Report Out

Launched

* View What's New

App Orchard

35

REDCap

Functional Areas

Research

Epic Versions

✓ Epic 2017 ✓ Epic 2018

Features

✓ Incoming API

Current

App Orchard Download

Ranking

#6 of 187 Apps

04/2019 - First Funded Trial (5 Sites) – Harris/Lindsay

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Next

CTSA

New Recruitment / Retention Tools

Embed in TIN Trials (CTSA Adoption)

National Library of Medicine Promoting EHRs & FHIR for Improving of Clinical Research

Feb 2019 ➔ Oct 2019
Thank You!

What about ...

Specific Data Types

Roadmap

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